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Perspective

Soil-Induced Increased Fertilization and Hatching of Carps

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Perspective

During extensive field study, to cover the bundh breeding program at certain districts of West Bengal, India, we came across with a unique traditional and innovative technology for increasing fertilization and hatching rate of carp eggs in captivity. Bund breeding is an age old practice of some kind of sympathetic breeding technology [1-4], by utilizing the undulating terrain and vast catchment area, for quality seed production in captivity [5]. This practice was in vogue before introduction of induced breeding technique in West Bengal and was the main source of quality supply to cultivators except natural source [6-8].

Recently this technique is rejuvenated again when a question raised regarding qualitativeness of hatchery raised seeds. During review of the breeding program we noticed that the fish breeders, engaged in raising seeds through bundhs are using a particular soil (collected 8 feet below the ground which are light yellowish in colour) available at the vicinity of said breeding area (Figure1). The fish breeders are using this soil since long, with different application procedure, both at breeding and hatching bundh (specialized pond), for increasing fertilization and hatching. Besides being an enhancer of fertilization and hatching rate, the soil by way of removing the adhesive glue, can increase the fertilization rate of fishes which lay adhesive eggs such as *Cyprinus carpio* [9].

Figure 1: Characteristic soil of Bankura district of West Bengal, India.

Figure 2: (B1, B2, B3 & B4) Experimental arrangement for fertilization & hatching percentage test.

To evaluate the efficiency of the soil [10], an experiment was designed by using 4 nos. of steel bowl at the site of bundh breeding (Figure 2). Different doses of soil were used in four separate steel bowl considering *Labeo rohita* as test fish. Each pot possesses a diameter 15 inches at top, height of 8 inches with a water holding capacity of 2 litres. The bowls were numbered as B1, B2, B3 and B4. To start with each were filled with 2 litres of water and left for two days. After two days in each bowl, except bowl no. 1 (which was maintained as control), was added with the soil to be tested. Generally 2, 4 and 6gm. Soil was added as base material in bowl no. 2, 3 and 4 respectively. The added soil was allowed to settle for 2 days and after that each bowl was stocked with 10ml fertilized eggs of *Labeo rohita* except control one. The experiment started at 10.00am and reviewed till hatching. From the result, hatching time and percentage were calculated as mentioned in Table 1. In Table 2 some criteria related induction of fish, spawning, hatching along with pH and temperature (both air and water) are depicted. The experiments were conducted at field condition and as we know temperature and pH play in crucial role in both spawning, fertilization and hatching so to correlate the both with overall breeding, these physical parameter were recorded. The recorded data indicate that available temperature was congenial for the said purpose. Other criteria which includes spawning, spawning time, hatching time corresponds the recommended data. The duration of the experiment means starting from injection to completion of hatching, it took on an average of 12 hours.

Table 1: Experiment for hatching rate on rohu fish (*Labeo rohita*), Place-Panchmura, Date-7.06.14, Time-10.00 am.

	Experimental Set-Up	B1 (Control)	B2 (2gm Soil)	B3 (4g Soil)	B4 (6gm Soil)
1	Amount of fertilized egg inoculated in ml	10ml	10ml	10ml	10ml
2	No. of eggs available for test	310	298	310	302
3	No. of eggs fertilized	133	199	211	215
4	No. of unfertilized eggs	177	99	99	87
5	Fertilization percentage	42.91	66.78	68.06	71.19
6	Hatching Percentage	39.21	72.12	73.09	78.08
7	No. of spawn at hatching	36	269	266	261
8	Time taken for hatching	3½hrs	4hrs	4½hrs	5hrs

Table 2: Observation on different time for hatching and breeding of experiment 3.

Air Temperature	30 °C
Water Temperature	24 °C
pH	6
No. of fish injected for spawning	30 out of 200 (100 male + 100 female)
Injection time	06.06.14 at 2.30 p.m.
Release of egg and spawn started	06.06.14 at 7.30 p.m.
Egg & spawn release completed	06.06.14 at 11.30 p.m.
Collection of egg started	07.06.14 at 8.00 a.m.
Egg transfer to hatching pond	07.06.14 at 9.00 a.m.
Hatching start	07.06.14 at 10.00 a.m.
Hatching end	07.06.14 between 1.30 p.m. to 3.00 p.m.

In Table 1 along with other relevant criteria fertilization and hatching rate are noted mainly to evaluate the role of soil in enhancing the said phenomenon. As per Table 1, 10ml of fertilized eggs were inoculated in each bowl but the number of eggs varied as per availability. Out of the total initial eggs (298-310), the fertilized and non-fertilized eggs were segregated according to number. Based on the number of fertilized eggs fertilization percentage (ranged from 42.91-71.19) was derived respectively for each separate bowl. Maximum fertilization was notice in bowl no. 4 (71.19%) and in no. 3 (68.06%). In bowl no. 2, the rate was 66.78% while in control it was 42.91%. Similarly hatching rate was maximum at bowl no.4 (78.80%), followed by bowl no. 3 (73.09%), no. 2 (72, 12%) and in control (39.21). Again soil based eggs took more time to hatch than that of the eggs maintained in control pot.

The experimental data, as envisaged from the Table no. 3, indicate a highly positive significant role of the soil under study, in enhancing the fertilization and hatching rate of eggs of *Labeo rohita*. One way anova test of the experimental data indicate highly significant value in respect of fertilization and hatching (P=0.003219).

Results of percentage wise elemental composition indicate oxygen was highest (50.38%), followed by silicon (22.52%), iron (15.21%), aluminium (5.5%) potassium (4.60%) and titanium (2.05%) (Table 3). The soil was completely devoid of carbon, chloride and calcium. One of the major elemental compositions of the soil under consideration is the presence of silicon in the form of silicon dioxide (SiO2). Besides acting as an abiotic component, it also influences the behaviour, breeding and spawning of psamophilic (sand loving) fishes and also acts as an aquifer by storing a large amount of water. With metallic ion it forms silicate salts like potassium and sodium silicate. In silicate form it not only acts as a ready source of oxygen but turns the water towards alkaline side. From the experiment and subsequent elemental analysis, we assume that the particular soil, create a favourable breeding, fertilization and hatching environment in aquatic system. Further study is needed to unveil the actual role of constituent element in stimulating the overall breeding behaviour of freshwater fishes [11-13].

Table 3: Observation on percentage composition, different element of experimental soil.

Element	Percentage Composition
Oxygen	50.38
Silicon	22.52
Aluminium	5.57
Potassium	4.6
Titanium	2.05
Iron	15.21
Carbon	0
Chloride	0
Calcium	0

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